

CLAIMS

1. A method of forming a planar lipid-bilayer membrane for membrane protein analysis, the method comprising the steps of:

(a) filling a microchannel with a buffer solution, the microchannel being disposed under a horizontal partition wall having an aperture;

(b) applying a small amount of a lipid solution as a droplet to the aperture filled with the buffer solution to form a thin layer of the lipid solution in a chamber, the chamber being formed at a position corresponding to the aperture of the partition wall and being provided with a liquid trap on the partition wall inside the chamber; and

(c) applying a buffer solution as a droplet to the chamber from the upper side thereof.

2. The method of forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 1, wherein the thickness of the thin layer of the lipid solution is controlled.

3. The method of forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 1 or 2, wherein the buffer solution contains a liposome (spherical vesicle of a lipid-bilayer membrane) incorporated with an

objective membrane protein, and the liposome is fused with the planar lipid-bilayer membrane to incorporate the membrane protein into the planar lipid-bilayer membrane.

4. The method of forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 1, wherein a plurality of the chambers are integrally formed.

5. The method of forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 4, wherein the plurality of the chambers are formed in an array.

6. The method of forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 4 or 5, wherein liposomes each containing a different protein are each applied to a different chamber, and different kinds of proteins are simultaneously measured.

7. The method of forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 4 or 5, wherein the reaction/binding of different kinds of reagents or different kinds of proteins in each of the chambers are simultaneously measured.

8. The method of forming a planar lipid-bilayer membrane

for membrane protein analysis according to claim 4 or 5, wherein the temperature of each chamber is independently controlled, liposomes each containing a different protein are each applied to a different chamber, and the proteins different in temperature are simultaneously measured.

9. A device for forming a planar lipid-bilayer membrane for membrane protein analysis, the device comprising:

- (a) a substrate;
- (b) a partition wall disposed over the substrate so as to be parallel to the substrate;
- (c) a microchannel defined by the substrate and the partition wall;
- (d) a chamber provided with an aperture formed in the partition wall and a liquid trap formed at the periphery of the aperture; and
- (e) a microinjection device for applying droplets of a lipid solution and a buffer solution to the chamber from the upper side of the chamber.

10. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 9, the device further comprising a first thin-film electrode disposed on the substrate at the position corresponding to the chamber and a second thin-film electrode disposed near

the liquid trap.

11. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 9 or 10, wherein the partition wall has a channel connected to the liquid trap for controlling the thickness of the layer of the lipid solution.

12. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 9 or 10, wherein a plurality of the chambers are integrally formed.

13. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 12, wherein the plurality of the chambers are formed in an array.

14. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 12 or 13, wherein the microinjection device further includes a cover for positioning the microinjection device relative to each chamber.

15. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 12

or 13, the device further comprising a means for applying liposomes each containing a different protein to the respective chambers and simultaneously measuring the different kinds of proteins.

16. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 12 or 13, the device further comprising a means for independently controlling the temperature of each chamber in an array, applying liposomes each containing a different protein to the respective chamber, and simultaneously measuring the proteins different in temperature.

17. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 9, wherein the aperture is provided with a taper so that the diameter of the aperture narrows from the lower side toward the upper side.

18. The device for forming a planar lipid-bilayer membrane for membrane protein analysis according to claim 9, wherein the partition wall is formed of a silicon substrate and the aperture is formed by etching the silicon substrate.

19. The device for forming a planar lipid-bilayer

membrane for membrane protein analysis according to claim 10, the device further comprising a means for measuring a property of the membrane protein by applying a voltage between the first thin-film electrode and the second thin-film electrode.